Plant Document Analysis

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End of Engineering Analysis Report

ENGINEERING SPECIFICATION ANALYSIS

Focus Area: Design Temparature

Generated on December 03, 2025

Section 1: Accepted Specifications for Evaluation of Design Temperature

(These items are present in the submitted document and align with standard requirements for establishing a Design Temperature — i.e., a defined design temperature basis, treatment of high temperatures, MDMT/low ambient considerations, and where Design Temperature is specified to be applied.)

• "Where not specified elsewhere in this document, the Design Temperature shall be 28 0 C (50 0 F) plus the coincidental temperature at the Design Pressure." (Section 9.5.2)

• "For temperatures beyond 3430 C (6500 F), the Design Temperature shall be 14 0 C (25 0 F) plus the coincidental temperature at the Design Pressure." (Section 9.5.2) [text as printed in document]

• "In cases where a temperature for a process upset scenario exceeds the maximum operating temperature plus 280 C (500 F) guideline, additional margin on the upset temperature is not required to set design temperature." (Section 9.5.2)

• "For equipment that may be under the purview of PESO, the minimum design temperature on the positive side shall not be less than 650 C." (Section 9.5.2) [text as printed]

• Minimum/low-ambient / MDMT rule: "The minimum design metal temperature for new design units is the most stringent of the following: The minimum ambient temperature less 5.6 o C (10 o F). The minimum operating temperature less 5.6 o C (10o F)." (Section 9.5.3)

• Vacuum/steam-out design guidance relevant to low-temperature limits (affects design temperature selection): "Columns and vessels subjected to steam out to be designed for at least half vacuum (0.5 kg/cm2 a)." (Section 9.5.4)

• Statement of scope for applicability: "This section of the guideline shall be used for OSBL; for ISBL, licensors guideline shall be followed." (Sections 9.5.2 and 9.5.3)

• General instruction tying Design Temperature to mechanical design stress: "The maximum design temperature determines the maximum allowable stress to be used for mechanical design of equipment." (Section 9.5.2)

• Note on use for relief valve and mechanical design: "Design conditions will be considered to establish relief valve set pressures and mechanical design." (Section 8.9.2 / 9.5 context)

• Repeated project-level instruction: many items state "Typical battery limit pressures and temperatures are indicated in Attachment 3. These numbers will be firmed up as system design progresses." (multiple sections) — relevant because battery-limit temperatures are inputs to determine coincidental temperature for design-temperature selection.

Section 2: Measurements Provided in Document

(Explicit temperature values and temperature-related Design Temperatures or limits shown in the document text / attachments.)

• Design Surface Temperature = 65° C (Section 7.2.2)

• Winterizing Temperature = 10° C (Section 7.2.2)

• Low Ambient Design Temperature = 7.5° C (Section 7.2.2)

• Design Temperature (DBT) for Air Coolers = 41° C (Section 7.2.2)

• Electrical Design Temperature (equipment outdoors) = 43° C (Section 7.2.2)

• Electrical Design Temperature (equipment indoors) = 40° C (Section 7.2.2)

• Maximum Recorded DBT = 48° C; Minimum Recorded DBT = 3° C; Maximum Recorded WBT = 28° C (Section 7.2.2)

• Steam battery-limit temperatures in Attachment 3 (Steam BATTERY LIMIT CONDITIONS):

• HHP Steam normal temperature = 510° C; design = 540° C (Attachment 3 steam table)

• HP Steam normal temperature = 383° C; design = 426° C (Attachment 3)

• MP Steam normal temperature = 232° C; design = 288° C (Attachment 3)

• LP Steam normal temperature = 158° C; design = 260° C (Attachment 3)

• (Corresponding pressures also listed in Attachment 3; temperatures above are explicit)

• Boiler Feed Water battery-limit temperatures (Attachment 3): Normal = 121° C; Design = 150° C (HHP/HP/MP/LP BFW entries share 121 / 150 values)

• Condensate battery-limit temperatures (Attachment 3): HP condensate normal = 254° C; design = 261° C; MP condensate normal = 203° C; design = 217° C; LP condensate notes: saturation temperatures are listed (e.g., LP condensate Normal 152° C, Design 175° C) — explicit values present in condensate table.

• Cooling water temperatures (Attachment 3, Cooling Water Battery Limit Conditions): Supply normal = 32° C; Return average = 45° C; Max outlet temperature of exchanger = 49° C; Water-side design temperature = 120° C (table entries)

• Raw/desal/DM/potable/fire water: Design surface or storage temperatures shown as "Amb" or 65° C design for raw/desal/DM in multiple battery-limit tables (explicit 65° C appears as 'Design' in several water battery limit tables).

• Fuel gas battery-limit temperatures: Fuel Gas normal temperature = 38° C; Fuel Gas Max = 94° C; Fuel Gas Design = 120° C (Attachment 3 fuel gas table)

• Instrument / plant / breathing air temperatures (Attachment 3): Normal = 40° C; Design = 65° C (table for Plant Air/Breathing Air/Instrument Air)

• Air cooler design instruction: "For air coolers use 41 °C ambient air dry bulb temperature." (Section 9.7.6)

• Heat exchanger preferred maximum tube lengths and temperature-related guidance (various notes) — e.g., avoid higher LMTD to prevent tube leak/bowing (Section 9.7.5) — relevant to temperature design.

Section 3: Inputs and Additional Requirements from Client

(Explicit client inputs stated in the document and explicit items the document calls out as to be provided/firmed up or missing for complete Design Temperature determination.)

• Document-level input: default Design Temperature rule: "28° C plus the coincidental temperature at the Design Pressure" when not otherwise specified. (Section 9.5.2)

• Document-level input: alternate rule for very high temperatures: "For temperatures beyond 3430 C (6500 F) ... 14° C plus the coincidental temperature..." (Section 9.5.2) — as printed.

• Applicability note: "This section ... shall be used for OSBL; for ISBL, licensors guideline shall be followed." — indicates the requirement for licensor-supplied design temperatures for ISBL items. (Sections 9.5.2 & 9.5.3)

• Repeated instruction: "Typical battery limit pressures and temperatures are indicated in Attachment 3. These numbers will be firmed up as system design progresses." — explicit requirement that battery-limit temperatures are provisional and must be finalized by OSBL designer / licensors. (multiple places)

• Explicit client-provided battery-limit temperature tables (Attachment 3) — these are inputs the designer is to use / confirm (see Section 2 for values).

• MDMT inputs required/defined: minimum ambient and minimum operating temperatures are to be used to compute MDMT (Section 9.5.3).

• The document explicitly calls out missing/future information to be provided:

• "Exact battery limit conditions will be firmed up during facility design." (Attachment 3 notes — multiple occurrences)

• "These numbers will be firmed up as system design progresses." (multiple locations)

• "To be verified during facility design." (Attachment 3 notes for steam, BFW, DM water, cooling water, etc.)

• "Where not specified elsewhere in this document, the Design Temperature shall be ..." (implies licensors / DEC must supply specific design temperatures where process conditions differ)

• Explicit requirement: For items under PESO, a minimum positive-side design temperature constraint is given ("shall not be less than 650 C" as printed) — to be applied where relevant. (Section 9.5.2)

• Explicit guidance that upset scenario margins beyond specified hot-up margins do not require additional design margin: "In cases where a temperature for a process upset scenario exceeds the maximum operating temperature plus 280 C (500 F) guideline, additional margin ... is not required." (Section 9.5.2)

• Client instruction to follow licensor/BED/DEC data for ISBL items: "For ISBL, licensors guideline shall be followed" — an explicit input/requirement that licensor-specified temperatures must be used where applicable.

• Coincidental temperature at the Design Pressure: the document prescribes "28°C plus coincidental temperature" but does not provide the coincidental temperature values for individual items — these must be supplied/confirmed for each item (Attachment 3 note: numbers to be firmed up).

• Many battery-limit tables contain placeholders or "Amb", "To be verified", "To be confirmed" — explicit callouts that exact temperatures/conditions at battery limits must be finalized during facility design (Attachment 3, multiple tables).

• ISBL-specific design temperatures and MDMTs: the document delegates to licensors for ISBL; therefore licensor-specified temperatures/data are required for ISBL equipment items (explicit statement).

• For steam/condensate/boiler-feed items: the Attachment 3 values are given as typical/current-installation references and explicitly require verification during facility design.

• For high-temperature clause: the document's high-temperature threshold and offsets are written in the document (see Section 9.5.2), but the printed numeric formatting contains apparent typographical errors (e.g., "3430 C (6500 F)" and "14 0 C (25 0 F)" as printed). The document itself does not clarify corrected numeric values — an explicit clarification from the client/licensor is required to interpret these lines unambiguously.

• Any process upset temperatures or transient coincident temperatures used to compute "coincidental temperature at the Design Pressure" must be provided / confirmed for each item (document repeatedly states transient/upset conditions and relief valve design rely on these but does not list them).

Strict compliance statements applied

• The lists above contain only temperature-related specifications, measurements, and explicit client requirements as stated verbatim or unmodified in the submitted document. No additional inferred temperatures, nor interpretations beyond the document's explicit statements, have been added.

End of Engineering Analysis Report